Does LUCAS bridge the gap between patient care and rescuer safety?

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Dedication

I dedicate this to my family and friends.

My mother, Cyndi, for supporting me mentally and financially throughout my entire education. Thank you so much for always being there for me to talk to and to calm me down when I was stressed. You are the best mom anyone could ever ask for and I could not have done any of this without you. I love you so!

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[Images removed to avoid copyright violation]

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Introduction

The purpose of this scholarly project is to evaluate the literature about the efficacy and worker safety of the LUCAS (Lund University Cardiac Arrest System) mechanical chest compression device compared to manual chest compressions during cardiopulmonary resuscitation. A literature review about this topic is needed in order to help health care facilities decide if the LUCAS device is worth purchasing when considering two factors: resuscitating our patients and protecting emergency medical services (EMS) personnel and our patients from the possible harm that can occur from the act of manual chest compressions. The goal is to determine if the benefits of the LUCAS device, including decreasing injuries to medics and patients and providing adequate chest compressions with less hands-off time, outweigh the negatives of the device, such as the cost of the device and the cost and time of training, when compared to manual chest compressions.

Research Question: Do the benefits of the LUCAS device, including decreasing injuries to medics and patients and providing adequate chest compressions with less hands-off time, outweigh the negatives of the device, such as the cost of the device and the cost and time of training, when compared to manual chest compressions?

Definitions

LUCAS device: A device that standardizes chest compressions in accordance with the latest scientific guidelines**.**

Myocyte: a contractile muscle cell**.**

Neuron: a grayish or reddish granular cell with specialized processes that is the fundamental functional unit of nervous tissue**.**

Cardiac arrest: abrupt temporary or permanent cessation of cardiac contractions (as from ventricular fibrillation or asystole)—called also *sudden cardiac arrest***.**

Cardiopulmonary resuscitation (CPR): CPR stands for cardiopulmonary resuscitation. It is an emergency lifesaving procedure that is done when someone's breathing or heartbeat has stopped. This may happen after a catastrophic event such as: an electric shock, myocardial infarction, or drowning.

EMS: emergency medical service(s).

Literature Review

Cardiac arrest is the leading cause of mortality in the United States. Ninety-five percent of people who die from sudden cardiac arrest die before they are transported to the hospital. Out-of-hospital cardiac events make up 70 percent of all sudden cardiac arrest cases. It is estimated that up to 30 percent of all patients who experience cardiac arrest could survive if advanced life support was promptly available. Immediate care provided by mechanical chest compression devices, such as the Lund University Cardiac Arrest device (LUCAS device), could provide prompt, safe and efficient advanced life support for patients who experience out-of-hospital cardiac arrest and reverse their sudden clinical death by maintaining blood to the patient's brain (LUCAS, n.d.-b).

The LUCAS device is a mechanical chest compression device that was developed in 2003 in order to overcome the problems that occur during manual chest compressions (see below). LUCAS was designed according to the international cardiopulmonary resuscitation (CPR) guidelines, providing at least 100 chest compressions each minute at a depth of 1.5-2.0 inches (LUCAS, n.d.-a). This device is intended for use on adults 16 years of age and older who have experienced acute circulatory arrest. Medical professionals, such as emergency medical services, are trained to use this device properly and often keep this device with them in the ambulance to use when someone has gone into circulatory arrest.

The LUCAS device has been perfected and become even more efficient since the first model of the LUCAS device was marketed and used by health care providers in 2003. Table 1, below, displays the features of each device, starting with the first device and ending with the most recent.

Table 1. Characteristics of each LUCAS device.

Device	Year	Weight (lbs.)	Sternum Height (inches)	Chest Width	Additional Features
LUCAS 1 V1	2003-2006	13.9	10.4	17.7	First LUCAS device to provide mechanical chest compressions at a depth of 4-5 cm at 100 compressions/minute. Provides an equal compression/decompression time and allows full chest recoil between compressions.
LUCAS 1 V2	2006-2009	13.9	11.9	17.7	Fits larger body habitus and improved operational features. Also provides mechanical chest compressions at a depth of 4-5 cm at 100 compressions/minute, provides an equal compression/decompression time, and allows full chest recoil between compressions.
LUCAS 2 SW 2.0	Summer 2009	17.2	10.4	17.7	Has an electric driving source, can be plugged in to any electric outlets including car charging ports and wall outlets, does not require test-cycles or reconditioning before use, the battery life is longer so it can sustain chest compressions for a total of 45 minutes when it is fully charged and not plugged in, and the battery is placed in the hood of the device which makes it lightweight and compactable for easy lifting, transport, and storage. Also provides 100 compressions per minute at 4-5 cm depth, provides an equal compression/decompression time, and allows full chest recoil between compressions.
LUCAS 2 SW 2.1	2011	17.2	10.4	17.7	Provides 102 compressions per minute and is adjustable to fit patients with smaller chest depths. Also compresses at a 4-5 cm depth, provides an equal compression/decompression time, and allows full chest recoil between compressions.
LUCAS 2 SW 2.2	2015	17.2	10.4	17.7	Added minor hardware and software updates compared to the SW 2.1. Also provides 102 compressions per minute at 4-5 cm depth, provides an equal compression/decompression time, allows full chest recoil between compressions, and adjustable to fit patients with smaller chest depths.

CPR needs to be very precise in order for it to be effective, which is one reason why the LUCAS device is so beneficial and effective. An optimal compression depth of 4-5 centimeters is necessary to push blood from the heart to the lungs to become oxygenated in order to perfuse the oxygenated blood back to the heart and out to the body’s tissues, organs, and brain (American Heart Association, 2016). It is also important to allow time for recoil of the lungs in order to bring in oxygen and exhale carbon dioxide. LUCAS was designed at these specific depths in order to provide optimal CPR for all body types and circumstances.

LUCAS provides adequate, appropriate chest compression number and depth to patients without rescuer fatigability and variability of worker capability. LUCAS allows chest compressions to be administered without transportation inconveniences affecting the quality of CPR. The device can be applied within seconds and allows for uninterrupted chest compressions to be administered in various settings and conditions in which manual compressions cannot.

ACLS guidelines state that no matter how strong or fit a person may be, CPR becomes less effective after two minutes of manual chest compressions. The longer one person performs CPR, the less efficacious manual chest compressions become, which becomes a significant problem when there are not enough EMS personnel to switch on and off the body in order to provide effective manual compressions. This also becomes difficult to maintain in confined areas and during patient transport. With LUCAS, there is no need to alternate personnel.

Some studies argue that LUCAS is not worth implementing because it does not improve patient survival rate. One study that believes LUCAS is not beneficial due to similar patient outcomes in regards to 30-day patient survival rate was performed by Perkins et al. (2015). This study compared the use of LUCAS-2 and manual chest compressions in out-of-hospital, non-traumatic cardiac arrest. This three-year study enrolled 4,471 patients, half receiving manual chest compressions and half receiving mechanical chest compressions by LUCAS-2. Their findings showed a similar 30-day survival rate in both groups of patients. This argument is flawed because it does not take into account the other benefits of the LUCAS device and is basing its efficacy on only one factor, which is patient survival. In order to make this assumption, they would need to study the survival rate in patients who received manual versus LUCAS CPR in different settings such as elevators, stairways, closed spaces, and spaces with a limited amount of people to provide CPR efficiently. This study, as well as other studies that have found no increase in survival rate of patients who received mechanical chest compressions via LUCAS, fail to recognize and study the other benefits of LUCAS, including rescuer safety and implementing LUCAS in arduous circumstances such as transport via ambulance, helicopter, and down flights of steps. The time to perform CPR also needs to be studied. The positive results of LUCAS found in other studies overwhelm the opinion that LUCAS is not beneficial due to patient survival rates when compared to manual compressions.

LUCAS can be used in small space environments such as during ambulance and helicopter transport and it can also be used during manual transport, such as carrying a patient down flights of stairs and in elevators, when manual CPR is nearly impossible (Gassler, Kummerle, Ventzke, Lampl, & Helm, 2015). Research shows that the LUCAS device may be beneficial in regards to reducing EMS occupational injury, as well as patient injury that can be caused from performing manual CPR (Sunde, Wik, & Steen, 1997).

A study by Sunde, Wik, and Steen (1997) compared the efficacies of manual and mechanical CPR performed by paramedics during on site cardiac arrest, manual transport, and ambulance transport. This data showed that mechanical CPR was more beneficial than manual CPR, especially during transport of patients on a stretcher. Gassler et al. (2013) showed that manually performing CPR during transport is dangerous for rescuers because they must be out of their seatbelts in order to preform appropriate chest compressions. Along with being unsafe, the study found that manual compressions performed during transport are almost always ineffective due to motion influences. This study stated that the quality of manual compressions decreased substantially during maneuver change and ambulance braking but the quality of mechanical chest compressions did not decrease or change due to constant and consistent administration.

A later study done by Olasveengen, Wik, and Steen (2008) continued to support the evidence that CPR quality was significantly better with mechanical compressions than with manual compressions. This study evaluated the quality of manual and mechanical CPR during transport after out-of-hospital non-traumatic cardiac arrest. Each patient received CPR before and during transport by EMS. Hands-off ratio, compression quality, and ventilation quality were measured. This study found that with manual CPR, hands-off time increased significantly during transport from 0.19+/-0.09 on-scene to 0.27+/-0.15 (p=0.002) and compression and ventilation rates did not change during transport, resulting in a reduced number of compressions per minute during transport from 94+/-14 min(-1) to 82+/-19 min(-1) (p=0.001). Overall, this study found that the quality of mechanical chest compressions was significantly better than the quality of manual chest compressions during transport.

The LUCAS device has been studied under many circumstances, including obtaining return of spontaneous circulation (ROSC) in patients with ventricular fibrillation and asystole. Steen, Liao, Pierre, Paskevicius, & Sjoberg (2002) preformed a randomized study on pigs in order to compare obtaining ROSC with LUCAS-CPR and with manual CPR during ventricular fibrillation. The study found that ROSC was obtained with the LUCAS device in 83 percent of pigs and ROSC was obtained in zero percent of pigs when using manual CPR. This study also presented a case in which a hospital patient went into asystole and manual compression was performed but was unsuccessful. At this time, the LUCAS device was initiated and ROSC was obtained in 3 minutes. This patient's mental capacity was fully regained within one year of the incident. This study determined that the LUCAS device is "light (6.5 kg), easy to handle, quick to apply (10-20 seconds), maintains correct position, and works optimally during transport both on stretchers and in ambulances." This study also concluded that LUCAS is significantly better at maintaining circulation during ventricular fibrillation than manual chest compressions.

Other anecdotal reports support the research studies cited above. In 2010, LUCAS was used during helicopter transport of a victim who fell into two degree Celsius water from a 25-meter high bridge. The patient developed hypothermia during this near-drowning event. EMS arrived 17 minutes after the patient began drowning. At this time, EMS provided manual compressions on the unresponsive patient with no pulse or respirations (i.e. clinically dead). Once in the rescue helicopter, mechanical chest compressions were started using the LUCAS device and ROSC was obtained. About 60 minutes later, they arrived at a trauma center and the patient was treated with extracorporeal circulation and warming. LUCAS was proven to be effective in this case and the patient was ultimately discharged with minor loss of cerebral function (Kyrval & Ahmad, 2010). Without the use of LUCAS, manual compressions would have been less efficacious in the helicopter setting. Performing manual chest compressions would also have decreased rescuer safety while doing CPR in an aircraft.

An article by Pietsch, Lischke, & Pietsch (2014) discusses the difficulties of performing pre-hospital manual CPR to patients in suboptimal conditions such as transporting patients by helicopter in mountainous areas. The article explains how difficult it is to perform high-quality chest compressions manually in alpine conditions. It also stresses the importance of minimizing hands-off time during CPR which they state is also problematic when performing manual CPR in high-altitude conditions. They used two mechanical chest compression devices, including the LUCAS device, to evaluate efficacy in austere circumstances. Over the course of 12 months, they performed CPR seven times in mountainous conditions. Any altitude above two miles (3.2 km) is considered above sea level. At this altitude, the air is less dense and the air molecules are farther apart. This makes it harder to breath, especially when trying to breath at extreme altitudes such as in the mountains, where altitudes can reach as high as 5.5 miles. In the mountains, a rescuer's oxygen saturation drops which makes them become tired more quickly than they would be in areas of lower altitude. Therefore, rescuers are more prone to deliver inadequate manual CPR than at sea-level, whereas the LUCAS device's quality of CPR does not decline at higher altitudes. The increase altitudes and decreased oxygen saturation might also make their hearts more vulnerable to infarct. The study concluded that mechanical chest compression devices are easy to use and appropriate to provide high quality CPR, especially in conditions where prolonged CPR is necessary, such as deep hypothermia in alpine areas which require superior rescue missions.

Another study done by Forti et al. (2014) showed that mechanical chest compressions administered by the LUCAS device during helicopter transport of a patient in cardiac arrest was safe and effective. This study states that although emergency percutaneous intervention (PCI) is effective in regards to increasing patient survival, the poor quality of manual CPR in ambulances deems manual CPR ineffective during transport. Because of this, transport of patients in cardiac arrest to a facility where PCI can be performed is ineffective. In this case, helicopter emergency medical services used the mechanical LUCAS chest compression device during helicopter transport of a 53-year old man in cardiac arrest. The LUCAS device administered mechanical chest compressions while the patient was transferred to the catheterization lab where a PCI took place. Return of spontaneous circulation (ROSC) was achieved in 115 minutes after cardiac arrest ensued and the patient survived without any neurological damage or deficits.

The LUCAS device has also been studied in cases of refractory cardiac arrest in which patients need to be transported to the hospital and undergo extracorporeal life support (ECLS). ECLS can be therapeutic or can be used to salvage organs for donation. Of the nine patients referred for organ donation, 18 kidneys were retrieved and 16 of these were successfully transplanted. In conclusion, this study found that it is beneficial to use mechanical chest compression during helicopter transport in refractory cardiac arrest patients in order to initiate ECLS and salvage the organs for donation (Tazarourte et al., 2013).

A recent study performed by Maurin et al. (2016), shows that even in cases where manual chest compressions are started, it is beneficial to implement and start the LUCAS device as soon as possible. Their study evaluated the amount of hands-off time when using one and two phase applications of mechanical chest compressions during out-of-hospital cardiac arrest cases. The study included 30 patients and showed that there was no significant difference between the amounts of hands-off-time when switching from manual to mechanical chest compressions whether a one or two phase application was implemented. The study states that the short amount of hands-off-time required to apply the LUCAS device makes it the most efficacious and first line choice of chest compression modalities during cardiac arrest and as a bridge when trying to sustain extracorporeal life support.

Not only does research support the use of LUCAS, local EMS providers in Toledo, Ohio advocate them and implement them in their everyday lives. During my field research, I talked with Brent Parquette, EMT-P, who is the Training and Quality Assurance Specialist and

Continuing Education Program Administrator for Lucas County EMS, and met with his colleague Jonathan Zieher, EMT-P, who is also a Lucas County EMS Continuing Education Program Administrator, to learn more about the LUCAS device from people who have used the device multiple times. Mr. Zieher explained to me the benefits of LUCAS over manual compressions, including freeing up EMS providers hands to help with other tasks such as obtaining vital signs, IV access, and pushing medications (Personal interview, 2016).

Another reason he is such a strong advocate of LUCAS is because they are able to use it easily in their ambulances during transport in order to provide safe and effective chest compressions. He explained how hard it is to provide adequate CPR when the ambulance is flying down the road at 60 miles per hour or more. He explained how efficacious the mechanical chest compression device is while transferring the patient from the site of arrest into the ambulance, as well as from the ambulance into the trauma bay at the hospital. He gave me a tour of the facility, showed me how to use the LUCAS devices, and gave me a tour of the different ambulances they use. The device only has three buttons on it and is very easy for anyone to use. It talks and commands you on what you need to do next, similar to an AED. It adjusts itself to the victim’s chest and applies adequate force in order to provide a 4-5 cm depth compression. It also automatically counts the number of compressions and can be set at rate of continuous compressions or it can be altered to give 30 compressions and leave time for two breaths via mask ventilation or manual breaths. It makes providing CPR less stressful and more reliable. He stated, “The tight quarters in the back of the vehicles make LUCAS a life-saver, literally” (Personal interview, 2016).

Not only is the LUCAS device beneficial for transport out of the hospital, but it is also beneficial for transport within the hospital. Some studies argue that it does not significantly change the mortality of the victims so they do not see the benefit of implementing LUCAS use in hospitals. This belief is flawed because LUCAS is still more efficacious in regard to worker and patient safety than manual compressions. As stated previously, it also frees up more hands in order for the health care team to manage more of the patient's life threatening issues at the same time. The argument is also flawed because these studies have not taken into consideration the fact that visitors and staff can code in stairways, elevators, bathrooms, closets. If they code in the stairways, they would receive inadequate CPR during transport to the ER if manual compressions were attempted during this time. A LUCAS could solve this problem.

Not only is LUCAS beneficial during transport in and out of hospitals, but it is also beneficial in suboptimal circumstances in which manual compressions cannot be applied, such as during cardiac surgery. A North American study was done to evaluate cardiac arrest management during coronary angiography and intervention. The study explains four patients that experienced cardiac arrest with acute ST-elevation myocardial infarction and one percutaneous coronary intervention (PCI) with the use of mechanical chest compressions. The study showed that mechanical chest compression devices, such as the LUCAS device, are beneficial for rescuers and patients on many levels. One advantage of mechanical chest compressions is the improvement in treatment of cardiac arrest before and during reperfusion by cardiac catheterization. Mechanical CPR is also beneficial for safety in Child Care Licensing (CCL). Using mechanical compressions requires less staff which frees up more people to complete other tasks, reduces the closeness of medical personnel to the source of radiation, and relieves more people from the field of imaging because medical personnel will not be preforming manual CPR during imaging thereby reducing the amount of radiation they receive. Without a mechanical chest compression device, the medical professionals performing manual CPR would be subject to radiation when radiation producing machines such as x-ray and CT scan are used in order to make sure coronary perfusion has been obtained in the correct vessels. Under these circumstances, chest compressions would be necessary during imaging in order to keep the patient alive and if a mechanical chest compression device is not available, they might not be able to perform the imaging that is necessary to ensure that coronary angiography and intervention was successful. The LUCAS device is also easy to work and assemble and it can be used safely and efficiently during coronary imaging and intervention (Azadi, Niemann, & Thomas, 2012).

Studies have also found that the LUCAS device is extremely efficacious when used to keep the heart beating during surgery. Jensen, Anderson, & Nissen (2013) describes a case where the LUCAS device was used during transcatheter aortic valve implantation in a high-risk elderly patient with aortic valve stenosis and congestive heart failure. During the surgery, the patient developed severe aortic regurgitation so the LUCAS device was initiated and continued for the duration of the 28-minute long surgery. There was no sign of cardiac or neurological damage upon evaluation 30 days after the surgery. Invasive blood pressures indicated that the LUCAS device is adept at sustaining adequate perfusion pressure, even in a high risk patient with an injured aortic valve. This study also showed that it is possible to perform continuous mechanical chest compressions using the LUCAS device during transcatheter aortic valve implantations.

Survival from PEA is poor. The survival rate cannot be defined numerically over all because mortality depends on whether PEA is the initial rhythm during cardiac arrest or if the patient had another rhythm, such as ventricular fibrillation or ventricular tachychardia, preceding the pulseless electrical activity. One study performed showed that patient who experienced PEA as their initial cardiac arrest rhythm had a highly mortality rate than patients who experienced another shockable rhythm in cardiac arrest before PEA (Meaney et al., 2010).

Bonnemeier et al. (2011) studied the result of using in-hospital mechanical chest compressions in 28 patients who experienced pulseless electrical activity (PEA) cardiac arrest due to pulmonary embolism, cardiogenic shock, acute myocardial infarction, sustained ventricular arrhythmias, severe hyperkalemia, and lightning strike. This study implemented the LUCAS device to deliver mechanical chest compressions to these patients. The patients underwent pulmonary and or cardiac angiography during or after mechanical CPR was administered. ROSC was accomplished in 27 out of the 28 patients. Although six of the patients with pulmonary embolisms were unable to receive thrombolytic medication due to contraindications, CT-angiography demonstrated thrombus fragmentation. This study proposes that mechanical chest compressions may help break down blood clots due to pulmonary embolisms and increase blood flow in the pulmonary artery without the use of thrombolytic therapy, in addition to providing adequate chest compressions in order to achieve ROSC. In conclusion, it was found that the LUCAS device delivers efficient and safe mechanical chest compressions, can help break down blood clots and increase pulmonary artery blood flow, and help improve the outcomes of patients who experienced PEA when the device is used in-hospital.

Not only does LUCAS help the patient, but it is also beneficial in regard to rescuer safety. Implementing the LUCAS device as an alternative to manual chest compressions could help minimize EMS injuries, especially during times of patient transport. The LUCAS device has shown to be a dependable alternative to manual CPR during patient transport in an ambulance. An eight-minute cardiac arrest simulation using CPR training manikins was performed during ambulance transport. The manual CPR group included two experienced paramedics and the other group used the LUCAS device to perform mechanical compressions. Using manual compressions, 67 percent of all chest compressions were considered correct, meaning that the compressions reached a depth greater than five cm, with a mean frequency of 103 per minute. Using LUCAS, 99.96 percent of chest compressions were considered correct. This study concluded that the use of LUCAS is safer for medical personnel and requires fewer human resources (Fox et al., 2013).

A study by Jones & Lee (2005) concluded that ambulance medics need to be provided with adequate support while performing manual CPR in order to avoid and minimize injuries, especially during patient transport. Ambulance personnel in Hong Kong who performed CPR received questionnaires regarding their experiences while providing manual CPR. A total of 318 questionnaires were completed. The results showed that manual CPR can last, on average, up to 32 minutes. Sixty percent of the 219 officers who have performed CPR on a bed reported having to climb on top of the bed in order to accurately perform manual compressions. Sixty percent reported “always” experiencing back discomfort while giving manual compressions, 36 percent reported having back pain “sometimes,” and only four percent said they did not experience any back pain. Eighty-nine percent of the rescuers said they were required to twist their backs and turn their heads often during CPR to look at the monitor. Of these rescuers, 24 percent suffered back injury and 62 percent believe that performing manual CPR was the cause of their injury. Fifty percent of the rescuers reported difficulty performing adequate CPR and maintaining balance during patient transport by ambulance. Implementing the LUCAS device could eliminate error and EMS CPR-related injury.

Much controversy has been raised about if the benefit of the LUCAS device outweighs its cost. The cost of one LUCAS 2 Chest Compression System is currently $14,495. This includes the unit with a back plate, instructions on how to use the device, two patient straps, a stabilization strap, a carrying bag, three suction cups, a rechargeable lithium polymer battery, and a three year warranty.

Many studies, including the ones discussed above, argue that the benefits of LUCAS outweigh the drawback of the cost of the device and training EMS to use the device. One newspaper, *The Cape Cod Times*, interviewed local EMS providers at multiple local fire departments who had the chance to use the LUCAS device during five cardiac arrests in an eight week period throughout the summer months. Chatham Deputy Fire Chief Pete Connick stated, “Cost is always a drawback. But cost versus benefit, the benefit significantly outweighs the cost. They do phenomenal CPR.” Captain Bill Piltzecker stated that the device allowed them to save many lives and even allowed them to transport a woman to the hospital who had drowned and did not have a pulse upon EMS’s arrival. She was able to maintain a heartbeat on her own after use of the LUCAS device. Unfortunately, this woman eventually passed away but LUCAS was able to keep her alive long enough for her family to see her and make a decision regarding organ donation (Bragg, 2015).

After having the chance to test the device and its effectiveness, the fire department made the decision to buy two LUCAS devices in order to keep one in each main ambulance. The devices were bought by donations from the fireman’s association and the firefighters union. They discussed the possibility of error with depth and number of compressions administered, how tiring the process can be, the requirement of many providers, and the limited amount of space in tight rescue locations such as a stairway for manual CPR to be administered correctly. Piltzecker stated, “This is a machine. It doesn’t slow down. It doesn’t think. It does each and every compression perfectly. It takes up less room and it frees up another paramedic to start other advanced life support. It’s almost like having another person with you. It’s very simple. It’s quiet. It works.” He also stated that mechanical chest compression devices can significantly reduce the risk of fracturing ribs when compared to manual compressions (Bragg, 2015).

Local fire officials stated that mechanical chest compression devices are not only better for the patient safety, but also for rescuer safety in the ambulance to decrease rescuer injuries. “The most vulnerable place to be is the back of the ambulance, standing up in the middle, leaning over, doing CPR,” Harwich EMS Officer Rob Sanders said. Another EMS provider stated that if a front-end collision occurs or the driver is forced to slam on the brakes, the rescuer doing manual compressions is “projectile,” which poses a huge safety risk. With use of the LUCAS device, providers can have their seat belts on (Bragg, 2015).

Because the American Heart Association states that cardiac arrest is the leading cause of death in the United States and saving someone’s life depends on how rapidly CPR is initiated and how effectively it is performed, the fire department decided that buying LUCAS devices was a necessary investment. On Cape Cod, all of the fire departments have purchased LUCAS devices, are in the process of purchasing them, or have it in their plans to purchase them. Bourne Shift Deputy Fire Chief Paul Weeks stated that it is nearly impossible to perform perfect manual chest compressions and that the LUCAS device does mechanically what humans are incapable of doing manually (Bragg, 2015).

Conclusion

Although some may believe the LUCAS device is an expensive investment, it has been proven to save lives and be very efficacious in regards to patient and provider safety. Money that might be spent in the long run on patient and provider injuries caused by manual compressions can be prevented by purchasing and implementing the LUCAS mechanical chest compression device. The LUCAS device provides a safer way to preform chest compressions, effective number and depth of compressions without fatigue, frees up more hands in emergency situations, can be used in hospitals as well as pre-hospital, can be used in tight quarters such as stairwells and helicopters, and can be used during PCI and other life-saving surgeries in which manual CPR is not an option. All of these factors should be taken into consideration when determining if the numerous pros of the LUCAS device outweigh the cons of the device, including device cost and cost and time of training EMS personnel.

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Abstract

The purpose of this scholarly project was to evaluate the literature about the efficacy and worker safety of the LUCAS mechanical chest compression device compared to manual chest compressions during cardiopulmonary resuscitation. A literature review about this topic is needed in order to help health care facilities decide if the LUCAS device is worth purchasing when considering two factors: resuscitating our patients and protecting emergency medical services (EMS) personnel and our patients from the possible harm that can occur from the act of manual chest compressions. The goal is to determine if the benefits of the LUCAS device, including decreasing injuries to medics and patients and providing adequate chest compressions with less hands-off time, outweigh the negatives of the device, such as the cost of the device, when compared to manual chest compressions. Cardiac arrest is the leading cause of mortality in the United States. Ninety-five percent of people who die from sudden cardiac arrest die before they are transported to the hospital. Out-of-hospital cardiac events make up 70 percent of all sudden cardiac arrest cases. It is estimated that up to 30 percent of all patients who experience cardiac arrest could survive if advanced life support was promptly available. Immediate care provided by mechanical chest compression devices, such as the Lund University Cardiac Arrest device (LUCAS device), could provide prompt, safe and efficient advanced life support for patients who experience out-of-hospital cardiac arrest and reverse their sudden clinical death by maintaining blood to the patient’s brain. Many studies have been evaluated to weigh the pros and cons of the LUCAS mechanical chest compression device. My literature review evaluates these studies and their findings in order to determine the efficacy of the mechanical chest compressions administered by the LUCAS device in comparison to manual chest compressions. In conclusion it was found that the LUCAS device provides a safe way to preform chest

compressions, effective number and depth of compressions without fatigue, frees up more hands in emergency situations, can be used in hospitals as well as pre-hospital, can be used in tight quarters such as stairwells and helicopters, and can be used during PCI and other life-saving surgeries in which manual CPR is not an option. All of these factors should be taken into consideration when determining if the pros of the LUCAS device outweigh the cons of the device, including device cost and cost and time of training EMS personnel.

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Complete Title: Does LUCAS Bridge the Gap between Patient Care and ~~Provider~~ Rescuer Safety?

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